

## CONTENTS

<u>Section</u>		<u>Page</u>
ABBREVIATIONS AND ACRONYMS.....		ix
1.0 INTRODUCTION.....		1
2.0 FACILITY CHARACTERIZATION.....		2
2.1 DESERET CHEMICAL DEPOT.....		2
2.1.1 Facility Location .....		3
2.1.2 History and Operations .....		6
2.1.3 Resource Conservation and Recovery Act-Regulated Activities at DCD .....		6
2.1.3.1 Tooele Chemical Agent Disposal Facility .....		7
2.1.3.2 Chemical Agent Munitions Disposal System .....		8
2.1.3.3 Hazardous Waste Storage Activities.....		9
2.1.3.4 Rapid Response System.....		11
2.2 EMISSION SOURCES AND AVAILABLE STACK GAS EMISSION RATE DATA .	11	
2.2.1 TOCDF Emission Sources .....		12
2.2.1.1 Liquid Incinerators 1 and 2 .....		23
2.2.1.2 TOCDF Metal Parts Furnace .....		24
2.2.1.3 TOCDF Deactivation Furnace .....		26
2.2.1.4 TOCDF Brine Reduction Area .....		30
2.2.1.5 TOCDF Heating, Ventilation, and Air Conditioning Filter System .....		30
2.2.2 CAMDS Emission Sources .....		30
2.2.2.1 CAMDS Metal Parts Furnace .....		32
2.2.2.2 CAMDS Liquid Incinerator .....		33
2.2.2.3 CAMDS Deactivation Furnace .....		33
2.2.2.4 CAMDS Heating, Ventilation, and Air Conditioning Filter System .....		34
2.2.3 Hazardous Waste Storage Area Emission Sources .....		34
2.2.4 Rapid Response System Emission Sources .....		35
2.3 COMPOUNDS OF POTENTIAL CONCERN.....		35
2.3.1 Step 1.....		37
2.3.2 Step 2.....		37

## CONTENTS (Continued)

<u>Section</u>		<u>Page</u>
2.3.3	Step 3.....	52
2.3.4	Step 4.....	53
2.3.5	Step 5.....	53
2.3.6	Step 6.....	53
2.3.7	Compounds of Potential Concern Identification Summary .....	54
2.4	EMISSION RATE CALCULATONS .....	54
2.4.1	Source-Specific Emission Rates .....	55
2.4.1.1	TOCDF LIC1 GB Emissions .....	55
2.4.1.2	TOCDF LIC2 GB Emissions .....	59
2.4.1.3	TOCDF MPF GB Emissions.....	60
2.4.1.4	TOCDF DFS GB Emissions .....	60
2.4.1.5	CAMDS MPF GB Emissions.....	61
2.4.1.6	CAMDS MPF VX Emissions .....	62
2.4.1.7	CAMDS DFS VX Emissions .....	62
2.4.1.8	CAMDS DFS HD Emissions .....	63
2.4.2	Extrapolated Emission Rates .....	63
2.4.2.1	TOCDF LIC1 VX Emissions .....	68
2.4.2.2	TOCDF LIC2 VX Emissions .....	69
2.4.2.3	TOCDF LIC1 HD Emissions .....	70
2.4.2.4	TOCDF LIC2 HD Emissions .....	70
2.4.2.5	TOCDF MPF VX Emissions .....	71
2.4.2.6	TOCDF MPF HD Emissions .....	72
2.4.2.7	TOCDF DFS VX Emissions .....	73
2.4.2.8	TOCDF DFS HD Emissions .....	74
2.4.2.9	CAMDS MPF HD Emissions .....	75
2.4.2.10	CAMDS DFS GB Emissions .....	76
2.4.3	Other Emission Sources To Be Evaluated .....	77
2.4.3.1	TOCDF BRA Emissions .....	77
2.4.3.2	TOCDF HVAC Emissions.....	78
2.4.3.3	CAMDS HVAC Emissions.....	78
2.4.4	Non-Detected COPCs .....	79
2.4.4.1	Detection Limit Reporting .....	79
2.4.4.2	Detection Limit Substitution.....	80

## CONTENTS (Continued)

<u>Section</u>		<u>Page</u>
2.4.5	Methodology for Emission Rate Correction Factors .....	80
2.4.5.1	Maximum Emission Rate Correction.....	81
2.4.5.2	Total Organic Emission Rate Correction.....	81
2.4.5.3	Process Upset Emission Rate Correction.....	83
2.4.5.4	Metal and Chlorine Emission Rate Correction .....	84
2.4.6	Modeling PCDDs and PCDFs, PAHs, Chromium, and Lead .....	85
2.4.6.1	Polychlorinated Dibenz(p)dioxin and Polychlorinated Dibenzofuran Emissions .....	86
2.4.6.2	Polycyclic Aromatic Hydrocarbons .....	88
2.4.6.3	Chromium .....	88
2.4.6.4	Lead.....	90
3.0	AIR DISPERSION AND DEPOSITION MODELING .....	91
3.1	OVERVIEW OF AIR MODELING PROCEDURES.....	91
3.2	SITE-SPECIFIC CHARACTERISTICS .....	93
3.2.1	Combustion Unit Emission Characteristics .....	93
3.2.2	Building Wake Effects .....	94
3.2.3	Watersheds .....	94
3.3	PARTITIONING OF EMISSIONS.....	95
3.4	METEOROLOGICAL DATA.....	95
3.5	AIR MODELING RESULTS .....	97
3.6	MODELING OF MERCURY .....	97
3.6.1	Phase Allocation and Speciation of Mercury Exiting the Stack.....	98
3.6.2	Vapor Phase Mercury .....	99
3.6.3	Particle-Bound Mercury.....	99
3.6.4	Deposition and Modeling of Mercury.....	99
4.0	EXPOSURE ASSESSMENT.....	99
4.1	EXPOSURE SETTING CHARACTERIZATION .....	100
4.1.1	Current and Potential Future Land Use .....	101
4.1.2	Water Bodies and Associated Watersheds.....	103
4.1.3	Special Sub-populations.....	104
4.2	EXPOSURE SCENARIOS .....	104
4.2.1	EPA Recommended Exposure Scenarios.....	105
4.2.2	Exposure Scenarios to be Evaluated .....	106

## CONTENTS (Continued)

<u>Section</u>		<u>Page</u>
	4.2.2.1 Current-Future Resident Adult and Child.....	106
	4.2.2.2 Current-Future Subsistence Rancher Adult and Child.....	112
	4.2.2.3 Current-Future Recreational Adult and Child.....	113
	4.2.2.4 On-Site Depot Worker .....	114
	4.2.2.5 Breast Milk Pathway.....	115
	4.2.2.6 Acute Exposure from Direct Inhalation .....	116
4.3	ESTIMATION OF EXPOSURE MEDIA CONCENTRATIONS.....	116
	4.3.1 Ambient Air Concentrations.....	117
	4.3.2 Surface Soil Concentrations .....	117
	4.3.3 Surface Water Concentrations.....	117
	4.3.4 Homegrown Produce Concentrations.....	118
	4.3.5 Meat and Eggs Concentrations.....	118
	4.3.6 Fish Concentrations.....	118
5.0	EXPOSURE QUANTIFICATION .....	118
5.1	CALCULATING AIR CONCENTRATIONS FOR DIRECT INHALATION .....	119
5.2	CALCULATING INTAKES FROM SURFACE SOIL .....	119
5.3	CALCULATING INTAKES FROM SURFACE WATER .....	119
5.4	CALCULATING INTAKES FROM HOMEGROWN PRODUCE.....	119
5.5	CALCULATING INTAKES FROM MEAT AND EGGS.....	123
5.6	CALCULATING INTAKES FROM FISH.....	123
6.0	TOXICITY ASSESSMENT .....	123
6.1	TOXICITY VALUES FOR CARCINOGENIC COPCS .....	123
6.2	TOXICITY VALUES FOR NONCARCINOGENIC COPCS .....	125
6.3	TOXICITY VALUES FOR CHEMICAL WARFARE AGENTS .....	126
6.4	TOXICITY VALUES CALCULATED BASED ON ROUTE-TO-ROUTE EXTRAPOLATION .....	127
7.0	RISK CHARACTERIZATION.....	130
7.1	METHODS FOR CALCULATING CANCER RISK .....	131
7.2	METHODS FOR CALCULATING NON-CANCER HAZARD.....	132
7.3	METHODS FOR EVALUATING THE BREAST MILK PATHWAY.....	134
	7.3.1 U.S. EPA-Recommended Methodology.....	134
	7.3.2 Limitations.....	136
7.4	METHODS FOR EVALUATING ACUTE EXPOSURE FROM DIRECT INHALATION.....	136
7.5	TARGET LEVELS .....	138

## CONTENTS (Continued)

<u>Section</u>		<u>Page</u>
8.0	PROPOSED PRESENTATION OF RESULTS .....	140
8.1	RISK AND HAZARD ESTIMATES FROM TOCDF EMISSIONS .....	140
8.2	RISK AND HAZARD ESTIMATES FROM CAMDS EMISSIONS .....	140
8.3	RISK AND HAZARD ESTIMATES FROM CAMDS AND TOCDF EMISSIONS COMBINED.....	141
9.0	UNCERTANTIES.....	141
9.1	UNCERTAINTY AND LIMITATIONS OF THE HUMAN HEALTH RISK ASSESSMENT PROCESS .....	141
9.2	TYPES OF UNCERTAINTY .....	141
9.3	METHODS FOR DETERMINING QUALITATIVE UNCERTAINTY .....	142
9.4	METHODS FOR DETERMINING QUANTITATIVE UNCERTAINTY .....	142
9.5	RISK ASSESSMENT UNCERTAINTY SECTION .....	143
10.0	CONCLUSIONS .....	143
11.0	REFERENCES.....	144

## APPENDICES

A	EMISSION RATE SPREADSHEETS FOR TOOELC CHEMICAL AGENT DISPOSAL FACILITY	
A-1	TOOELC CHEMICAL AGENT DISPOSAL FACILITY LIQUID INCINERATOR 1 GB EMISSION RATES	
A-2	TOOELC CHEMICAL AGENT DISPOSAL FACILITY LIQUID INCINERATOR 2 GB EMISSION RATES	
A-3	TOOELC CHEMICAL AGENT DISPOSAL FACILITY LIQUID INCINERATOR 1 VX EMISSION RATES	
A-4	TOOELC CHEMICAL AGENT DISPOSAL FACILITY LIQUID INCINERATOR 2 VX EMISSION RATES	
A-5	TOOELC CHEMICAL AGENT DISPOSAL FACILITY LIQUID INCINERATOR 1 HD EMISSION RATES	
A-6	TOOELC CHEMICAL AGENT DISPOSAL FACILITY LIQUID INCINERATOR 2 HD EMISSION RATES	
A-7	TOOELC CHEMICAL AGENT DISPOSAL FACILITY METAL PARTS FURNACE GB EMISSION RATES	
A-8	TOOELC CHEMICAL AGENT DISPOSAL FACILITY METAL PARTS FURNACE VX EMISSION RATES	
A-9	TOOELC CHEMICAL AGENT DISPOSAL FACILITY METAL PARTS FURNACE HD EMISSION RATES	
A-10	TOOELC CHEMICAL AGENT DISPOSAL FACILITY DEACTIVATION FURNACE GB EMISSION RATES	

## CONTENTS (Continued)

<u>Section</u>	<u>Page</u>
A-11	TOOELE CHEMICAL AGENT DISPOSAL FACILITY DEACTIVATION FURNACE VX EMISSION RATES
A-12	TOOELE CHEMICAL AGENT DISPOSAL FACILITY DEACTIVATION FURNACE HD EMISSION RATES
B	EMISSION RATE SPREADSHEETS FOR CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM
B-1	CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM METAL PARTS FURNACE GB EMISSION RATES
B-2	CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM METAL PARTS FURNACE VX EMISSION RATES
B-3	CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM METAL PARTS FURNACE HD EMISSION RATES
B-4	CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM DEACTIVATION FURNACE GB EMISSION RATES
B-5	CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM DEACTIVATION FURNACE VX EMISSION RATES
B-6	CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM DEACTIVATION FURNACE HD EMISSION RATES 1992 TEST 1
B-7	CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM DEACTIVATION FURNACE HD EMISSION RATES 1992 TEST 2
C	EMISSION RATE CALCULATIONS FOR HEATING, VENTILATION, AND AIR CONDITIONING SYSTEMS AND BRINE REDUCTION AREA
C-1	TOOELE CHEMICAL AGENT DEMILITARIZATION FACILITY BRINE REDUCTION AREA EMISSION RATES
C-2	TOOELE CHEMICAL AGENT DEMILITARIZATION FACILITY HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM EMISSION RATES
C-3	CHEMICAL AGENT MUNITIONS DESTRUCTION FACILITY HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM EMISSION RATES
D	CHEMICAL AND PHYSICAL PROPERTIES FOR CHEMICAL OF POTENTIAL CONCERN AT TOOELE CHEMICAL AGENT DEMILITARIZATION FACILITY AND CHEMICAL AGENT MUNITIONS DESTRUCTION
E	EQUATIONS AND PARAMETER VALUES FOR CALCULATING CHEMICAL OF POTENTIAL CONCERN-SPECIFIC MEDIA CONCENTRATIONS
F	RISK CHARACTERIZATION EQUATIONS AND PARAMETER VALUES

## **ATTACHMENT**

ATMOSPHERIC MODELING OF DESERET CHEMICAL DEPOT FINAL REPORT (MRI 1999)

## TABLES

<u>Table</u>	<u>Page</u>
TABLE 2-1 CHEMICAL MUNITIONS STOCKPILE DESERET CHEMICAL DEPOT .....	4
TABLE 2-2 CAMDS METAL PARTS FURNACE PERMITTED WASTE FEEDS AND FEED RATE LIMITS.....	13
TABLE 2-3 TOCDF METAL PARTS FURNACE PERMITTED WASTE FEEDS AND FEED RATE LIMITS.....	14
TABLE 2-4 JACADS METAL PARTS FURNACE PERMITTED WASTE FEEDS AND FEED RATE LIMITS.....	15
TABLE 2-5 CAMDS DEACTIVATION FURNACE PERMITTED WASTE FEEDS AND FEED RATE LIMITS.....	16
TABLE 2-6a TOCDF DEACTIVATION FURNACE PERMITTED WASTE FEEDS AND FEED RATE LIMITS.....	17
TABLE 2-6b TOCDF DEACTIVATION FURNACE PERMITTED WASTE FEEDS FOR COMBINED M55 ROCKETS AND GB PROJECTILE COMPONENTS.....	18
TABLE 2-7 JACADS DEACTIVATION FURNACE PERMITTED WASTE FEEDS AND FEED RATE LIMITS.....	19
TABLE 2-8 CAMDS LIC PERMITTED WASTE FEEDS AND FEED RATE LIMITS.....	20
TABLE 2-9 TOCDF LIC PERMITTED WASTE FEEDS AND FEED RATE LIMITS.....	21
TABLE 2-10 JACADS LIC PERMITTED WASTE FEEDS AND FEED RATE LIMITS.....	22
TABLE 2-11 MPF ENGINEERING DATA .....	25
TABLE 2-12 DFS ENGINEERING DATA .....	28
TABLE 2-13 SUMMARY OF COPC IDENTIFICATION PROCESS.....	38
TABLE 2-14 METHODOLOGY FOR EMISSION RATE CALCULATIONS AND EXTRAPOLATIONS .....	56
TABLE 2-15 TOXICITY EQUIVALENCY FACTORS FOR DIOXINS AND FURANS .....	87
TABLE 2-16 RELATIVE POTENCY FACTORS FOR POLYCYCLIC AROMATIC HYDROCARBONS.....	89

## TABLES (Continued)

<u>Table</u>		<u>Page</u>
TABLE 3-1	AIR MODELING SOURCES AND SOURCE-SPECIFIC PARAMETERS USED IN AIR DISPERSION MODELING .....	96
TABLE 4-1	EXPOSURE PATHWAYS AND SCENARIOS FOR THE TOCDF HUMAN HEALTH RISK ASSESSMENT .....	107
TABLE 4-2	POTENTIAL EXPOSURE PATHWAYS FOR EMISSIONS FROM DESERET CHEMICAL DEPOT .....	108
TABLE 5-1	EXPOSURE PARAMETERS FOR HEALTH RISK ASSESSMENT .....	120
TABLE 6-1	TOXICITY VALUES FOR CHEMICAL WARFARE AGENTS PROPOSED FOR USE IN THE TOCDF HHRA .....	128

## FIGURES

FIGURE 2-1	SITE LOCATION MAP .....	5
FIGURE 3-1	LAND USE AND LAND COVER MAP .....	92